CLAIMS

1. An ultrasound imaging system 10, comprising:

a processing system 12 configured to generate ultrasound energy and to detect signals at ultrasound frequencies; and

an ultrasound scan head 40 electrically coupled to the processing system 12, the assembly 30 including an ultrasound transducer array operatively coupled to a positional actuator 42 having a driven member that rotates about a first axis to pivot the array about a second axis substantially perpendicular to the first axis.

2. The imaging system 10 of claim 1, wherein the ultrasound scan head 40 includes a positional sensor 44 coupled to the driven member that is configured to detect a rotational position of the driven member.

3. The imaging system 10 of claim 2, wherein the processing system 12 further includes a controller 26 electrically coupled to the positional actuator 32 to transmit positioning signals to the actuator 32, and to receive positional signals from the positional sensor 34.

4. The imaging system 10 of claim 1, wherein the ultrasound transducer array 30 comprises a planar arrangement of ultrasound transducer elements.

5. The imaging system 10 of claim 1, wherein the ultrasound transducer array 30 comprises a linear arrangement of ultrasound transducer elements that is curved along a length of the array.

6. The imaging system 10 of claim 3, further comprising a display coupled to the controller, the display operable to visually display ultrasound images generated by the processor 12.

7. An ultrasound scan head 40 for ultrasound imaging, comprising:

an ultrasound transducer array 30 having a plurality of transducer elements for transmitting acoustic energy in response to an applied electrical signal and transducing returned acoustic energy into electrical signals;

a positional actuator 42 having a driven member configured to be rotated about a first rotational axis and coupled to a pivot member that supports the array 30, the pivot member being configured to rotate about a second rotational axis substantially perpendicular to the first axis; and

a positional sensor 44 coupled to the positional actuator 42 and operable to sense a rotational position associated with the positional actuator 42.

8. The ultrasound scan head 40 of claim 7, wherein the positional actuator 42 includes a permanent magnet field structure 54 coupled to a drive shaft 48, and an armature structure 52 that is stationary with respect to the drive shaft 48.

9. The ultrasound scan head 40 of claim 7, wherein the positional actuator 42 includes a crank member 56 coupled to a drive shaft 48, the crank member 56 having a receiving portion angled inwardly towards the first rotational axis, and the pivot member 60 includes a coupling, the crank member 56 being coupled to the pivot member 60 by a connecting member 58 that is rotatably received by the receiving portion at one end, and hingeably received by the coupling at an opposing end.

10. The ultrasound scan head 40 of claim 9, comprising:

a cover 70 positioned proximate to the array that at least partially defines an internal volume 72 that contains the array 30, the internal volume 72 sealably containing a volume of an acoustic coupling fluid.

11. The ultrasound scan head 40 of claim 10, wherein the internal volume 72 includes an expandable bladder 76 that adjusts to variations in the volume 72 of the acoustic coupling fluid.

12. The ultrasound scan head 40 of claim 7, wherein the positional sensor 44 includes a sensor capable of detecting an angular position of the driven member by optical means.

13. The ultrasound scan head 40 of claim 7, wherein the positional sensor 44 includes a sensor capable of detecting an angular position of the driven member by magnetic means.

14. The ultrasound scan head 40 of claim 7, wherein the positional sensor 44 includes a counter 66 having an angular resolution of at least 1000 counts per revolution.

15. In a scan head 40 having a driven member rotatable about a first axis and coupled to an ultrasound array 30 rotatable about a second axis, a method for three-dimensional imaging a portion of a body, comprising:

controlling the rotation of the driven member over a predetermined rotational interval to provide approximately constant rotation of the array 30; and

acquiring ultrasound data along a plurality of mutually spaced-apart scan lines.

16. The method of claim 15, wherein controlling the rotation of the driven member further comprises varying the sweeping range of the transducer array 30 to improve scan efficiency with a continuous variable speed rotation.

17. The method of claim 15, wherein acquiring ultrasound images further comprises acquiring the images along scan lines that are approximately equally spaced apart.

18. The method of claim 15, wherein controlling the rotation of the driven member further comprises maintaining the rotation of the driven member at a constant rotational value for a first rotational interval; and controlling the rotation of the driven member to provide an approximately constant rotation of the array for a second rotational interval.

19. The method of claim 15, wherein acquiring ultrasound images further comprises processing the data to develop an ultrasound image.

20. The method of claim 15, further comprising :

repetitively sweeping the array across the body portion; and

obtaining a data image set corresponding to each successive sweep.